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# FACT SHEET



UNITED STATES  
DEPARTMENT  
OF AGRICULTURE



ENERGY  
CONSERVATION  
IN THE RURAL HOME

## How To Determine Your Insulation Needs

The cost for heating and cooling an average home for a year climbed drastically from \$600 in 1974 to \$1,090 in 1977. You can help control those costs in existing or new homes by adding insulation. The cost of adding insulation ranges from \$300 to \$1,500 depending on the size and needs of the house. However, you should be able to recover your insulation costs through fuel savings in a few years.

Several programs are available through your local power or gas distributor or the Farmers Home Administration to assist you in financing your insulation costs at comparatively low interest rates.

### How Much Insulation?

The amount of insulation to use depends on the climate in the zone where you live, your specific area, and local utility costs. For example, persons living where the climate is mild year-round will not require as much insulation as those who live in areas of extreme climatic conditions.

Insulation needs are usually measured in inches of thickness. R value, however, is a better indicator of its effectiveness. R stands for Resistance and indicates the capacity of insulation to resist heat flow. The higher the R value, the better the insulation. You can find which insulation is the best buy by comparing dollar costs per R value, just as you might compare dollars per ounce of food at the grocery market.

To determine the minimum total R value recommended for insulating ceilings, walls, and floors in your area see the map (figure 3).

After determining the total R value recommended for your area, find out how much more insulation you will need to add beyond what your home al-

ready has in order to bring it up to the recommended level.

Example—let's say that a home was constructed several years ago in St. Louis, Missouri. You want to find out how much additional ceiling insulation is required for best results. You would do the following:

Step 1. Find the recommended R values for the St. Louis, Mo., area. The map in figure 1 indicates these to be R-30/19/19. This means it recommends R-30 for ceilings, R-19 for walls, and R-19 for floors. Therefore, for the ceiling, R-30 is the total insulating value to be achieved.

Step 2. Now measure the thickness and note the type of insulation already in the home. Use a ruler or yardstick. To determine the type of insulation, compare it with the description given in table 1. If you are still not sure, ask a local building supplier to identify a sample. Let's say you find that between 3-1/2" to 4" of fiberglass batt is already used for insulation.

### WHERE

Figures 1 and 2 indicate where insulation or other protective measures are most needed.

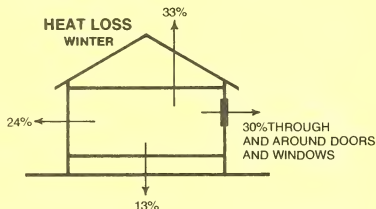


Figure 1. Points of winter heat loss.

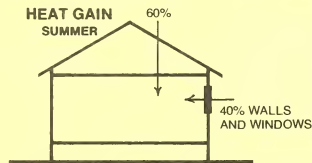


Figure 2. Points of summer heat gain.

Step 3. Determine the R value of existing insulation. From table 3, which compares total insulation thickness, types and R values, you can see that 3-1/2" to 4" of fiberglass batt has an R value of R-11.

Step 4. Now determine how much more insulation is needed by subtracting what is already there (R-11) from the recommended amount (R-30 for the ceiling).

Step 5. Finally, determine the amount of insulation you must add to add an additional R-19. Go back to table 2 and read across from R-19. You will have several choices. You could add:

- (a) 6"-6 1/2" fiberglass batts or blankets
- (b) 5-1/4" rock wool batts or blankets
- (c) 8"-9" blown or poured in fiberglass
- (d) 6"-7" blown or poured in rock wool
- (e) 5" blown-or poured-in cellulose

Any one of these choices would provide the total recommended insulation required added to the existing insulation. Your final decision may be based on which material is most economical, most readily available, or other individual requirements.

### Fix Loss Leaders First

In the winter, about 24 percent of the heat loss in

a home occurs through or around the doors and windows. Another 33 percent goes through the ceiling. The remaining 13 percent goes through the floor if there is a vented crawlspace or no basement. In the summer, heat enters through the ceiling, the side walls, and windows. Therefore, for maximum year-round comfort, the side walls, floors, and ceiling need to be insulated. Remember that windows and doors should be insulated in the form of weatherstripping, double glazing, or storm windows and doors. In northern climates storm windows over existing double glazing may pay off in fuel saved.

In existing homes, first caulk and weatherstrip around windows and doors to eliminate air leaks. Next, insulate in the attic. Then insulate doors and windows by adding storm sashes of glass or plastic. Finally, if your home has a crawlspace, add under-floor insulation, or insulate the walls of the crawlspace or basement.

What about adding insulation to existing exterior walls? It usually costs too much for the insulation to pay for itself within a reasonable length of time. It can, however, increase the comfort level.

TABLE 1. MAJOR TYPES OF INSULATION







|   |   |
|---|---|
| <p><b>BATTS</b> — glass fiber, rock wool</p>  <p>Where they're used to insulate:<br/>unfinished attic floor<br/>unfinished attic rafters<br/>underside of floors<br/>open sidewalls</p>                             | <p><b>BLANKETS</b> — glass fiber, rock wool</p>  <p>Where they're used to insulate:<br/>unfinished attic floor<br/>unfinished attic rafters<br/>underside of floors<br/>open sidewalls</p>   |
| <p><b>FOAMED-IN-PLACE</b> — EXPANDED URETHANE</p>  <p>Where it's used to insulate:<br/>finished frame walls</p>   | <p><b>RIGID BOARD</b> — polystyrene (extruded), expanded urethane (preformed), glass fiber, polystyrene (molded beads)</p>  <p>Where it's used to insulate:<br/>exterior wall sheathing<br/>floor slab perimeter</p> <p><b>NOTE:</b> Care should be taken with these products to assure fire safety.</p> |
| <p><b>LOOSE FILL (blown-in)</b> — glass fiber, rock wool, cellulose</p>  <p>Where it's used to insulate:<br/>unfinished attic floor<br/>finished attic floor<br/>finished frame walls<br/>underside of floors</p> | <p><b>LOOSE FILL (poured-in)</b> - glass fiber, rock wool cellulose, vermiculite, perlite</p>  <p>Where it's used to insulate:<br/>unfinished attic floor</p>  |

TABLE 2. INSULATING VALUES OF SEVERAL INSULATING AND BUILDING MATERIALS

| MATERIAL  | INSULATION VALUE       |                             |
|---|------------------------|-----------------------------|
|   | "R" PER INCH THICKNESS | "R" FOR THICKNESS INDICATED |
| <b>BATT OR BLANKET INSULATION</b>   |                        |                             |
| Wood or cellulose fiber with vapor barrier and paper facing               | 3.20-4.00              |                             |
| Glass wool or mineral wool  | 3.00-3.80              |                             |
| <b>LOOSE FILL INSULATION</b>  |                        |                             |
| Mineral wool (rock, glass, or slag)                                       | 2.80-3.70              |                             |
| Vermiculite (expanded) Perlite (expanded)                                 | 2.13-2.70              |                             |
| Cellulose   | 3.50-3.70              |                             |
| <b>RIGID INSULATION</b>   |                        |                             |
| Polystyrene foam, extruded or expanded                                    | 4.00-5.40              |                             |
| Polystyrene, molded beads   | 3.57                   |                             |
| Expanded urethane, sprayed or preformed                                   | 5.80-8.00              |                             |
| Polyurethane, expanded  | 6.25-8.00+             |                             |
| Glass fiber   | 4.00                   |                             |
| Insulating sheathing board (1/2" reg. density)                            | 1.32                   |                             |
| (25/32" reg. density)   | 2.06                   |                             |
| <b>CONSTRUCTION MATERIALS</b>   |                        |                             |
| Concrete, sand, and stone aggregate                                       | 0.08                   |                             |
| Concrete block, three hole, 8"  | 0.95-1.11              |                             |
| Concrete block, lightweight aggregate, 8"                                 | 1.72-2.18              |                             |
| Concrete block, lightweight aggregate, 8" (Cores filled with vermiculite) | 4.00-5.03              |                             |
| Face brick 4"   | .44                    |                             |
| Hardwoods, maple, oak, etc.   | 0.91                   |                             |
| Softwoods, fir, pine  | 1.25                   |                             |
| 3/8" Plywood  | 0.47                   |                             |
| 1/2" Plywood  | 0.62                   |                             |
| Hardboard, 1/4" tempered  | 0.25                   |                             |
| Wood siding, 1/2" thick clapboard   | 0.81                   |                             |
| Asphalt shingles  | .44                    |                             |
| Aluminum or steel over flat sheathing                                     | 0.5-0.65               |                             |
| Gypsum or plaster board 3/8"  | 0.32                   |                             |
| Gypsum or plaster board 1/2"  | 0.45                   |                             |
| Plaster, brick or stucco  | 0.11-0.20              |                             |
| Steel or aluminum   | 0.007                  |                             |
| Glass   | 0.003                  |                             |
| <b>DOORS</b>  |                        |                             |
| Solid wood 1 inch   | 1.55                   |                             |
| Solid wood 2 inch   | 2.32                   |                             |
| Solid wood 2 inch plus metal and glass storm door                         | 3.45                   |                             |
| <b>WINDOWS (glass only)</b>   |                        |                             |
| Single glazing  | 0.88                   |                             |
| Double glazing (1/4" to 1/2" air space)                                   | 1.60-1.75              |                             |
| Single glazing with storm windows   | 1.75-1.89              |                             |
| <b>AIR SPACE</b>  |                        |                             |
| Bounded by ordinary materials (vertical space)                            | 3/4" or more           | .97                         |
| Horizontal-heat flow down   | 3/4" or more           | 1.25                        |
| Horizontal-heat flow up   | 3/4" or more           | .85                         |

TABLE 3. INSULATING R VALUE EQUIVALENTS

|      | BATTS OR Blankets |           | "LOOSE FILL |           |                  |      |
|------|-------------------|-----------|-------------|-----------|------------------|------|
|      | glass fiber       | rock wool | glass fiber | rock wool | cellulosic fiber |      |
| R-11 | 3 1/2"-4"         | 3"        | 5"          | 4"        | 3"               | R-11 |
| R-19 | 6"-6 1/2"         | 5 1/4"    | 8"-9"       | 6"-7"     | 5"               | R-19 |
| R-22 | 6 1/2"            | 6"        | 10"         | 7"-8"     | 6"               | R-22 |
| R-30 | 9 1/2"-10 1/2"*   | 9"        | 13"-14"     | 10"-11"   | 8"               | R-30 |
| R-38 | 12"-13"*          | 10 1/2"*  | 17"-18"     | 13"-14"   | 10"-11"          | R-38 |

\*Two batts or blankets required.

\*\*Must be poured or blown to mfg. specification for correct density.

## Fact Sheets In The Home Weatherization Series

1. Why Weatherize Your Home?
2. How To Determine Your Insulation Needs
3. Saving Heating and Cooling Dollars with Weatherstripping and Caulking
4. How To Save Money With Storm Doors and Windows
5. What To Look for in Selecting Insulation
6. How To Install Insulation for Ceilings
7. How To Install Insulation for Walls
8. How To Install Insulation for the Floor and Basement
9. Solving Moisture Problems with Vapor Barriers and Ventilation
10. Weatherize Your Mobile Home To Keep Costs Down, Comfort Up
11. Tips on Financing Home Weatherization
12. Keeping Home Heating and Cooling Equipment in Top Shape
13. Landscaping To Cut Fuel Costs
14. Home Management Tips To Cut Heating and Cooling Costs
15. Locating New Home Sites To Save Fuel

Single copies are available upon request to Special Reports Division, Office of Governmental and Public Affairs, U.S. Department of Agriculture, Washington, D.C. 20250.

This series of fact sheets was assembled from research, Extension and other sources by the USDA Task Force on Weatherization.

How much do you need? Well, where do you live?



Figure 3. Map Indicating Minimum Recommended R-Values by Area and Climate